Artificial intelligence in logistics value delivery platforms

KEARNEY

Global supply chains have increasingly been rocked by human crisis and geopolitical events. To continue delivering goods effectively, companies are testing advanced technologies to help them orchestrate their operations during these difficult times.

Introduction

From conventional to cutting-edge: logistics transformation in the 21st century

In today's dynamic marketplace, consumers demand products that offer both affordable quality and best delivery. While the first demand is not new, the second demand—best delivery—has rapidly evolved in the past decades, driven by the proliferation of e-commerce offerings in a constant race to outpace competitors by ensuring their products reach customers as desired. This continuous pursuit requires dependable and resilient supply chains that rely on a robust transportation network and better intelligence on what winning delivery should look like.

The COVID-19 pandemic and subsequent geopolitical and economic events have exposed cracks in the supply chains and delivery networks of most global firms. Given the challenging landscape, the question emerges: How can companies make their logistics networks more robust and resilient to unpredictable shocks without overextending their budget or obstructing the indispensable flow of goods?

Technological adoption helps answer this question, and recent strides in artificial intelligence (AI) have intrigued most logisticians to explore and adopt this technology. Advancements in machine learning, computing, content generation, and big data within the AI domain have presented a compelling case for logisticians to delve into AI's application within their operations. In this article, we explore signficiant AI use cases in the operations of prominent logistics firms and the logistics divisions of major corporations.

Current challenges in the logistics industry

Cost, delays, shortages, regulations—and more

Today's logisticians face numerous internal and external roadblocks as they look to keep their networks running with optimal speed and efficiency. From keeping a handle on transportation costs, dealing with labor shortages, and encountering myriad shipping delays, to having to hit ambitious new sustainability targets, tracking inconsistencies, and complying with emerging and expanding government regulations, logistics leaders certainly have their hands full. To effectively respond to these challenges and make informed decisions regarding supply–demand dynamics, capacity movements, and pricing trends, logistics leaders need to stay updated on market trends and analyze extensive data from market reports, freight indices, and expert opinions. However, this process is often cumbersome, requiring significant time investment in connecting the dots across a large volume of internal and external data.

The good news is that AI is well-suited to help address these and other challenges, offering companies compelling opportunities for deploying AI in very impactful ways (see figure 1 on page 3). The technology is especially useful in helping companies reduce costs, effectively deal with data, do more with fewer people, and respond to or avoid disruptions that add unwanted time to deliveries.

AI is especially useful in helping companies reduce costs, do more with fewer people, and respond to or avoid disruptions that add unwanted time to deliveries.

Figure 1

There are a number of compelling opportunities for companies to deploy AI in very impactful ways

Challenges	Description	Intensity of impact
Transportation costs	—US transportation costs surged by 19.6% in 2022[1] —New commercial vehicle prices in the US increased by 6.5% in 2023 —US gas prices peaked in 2022, rising a staggering 31.2%[1]	▉▉▉▉▉ (5/5)
Worker shortage	—Severe manpower shortage caused by demanding conditions, aging workforce, and low female representation —Shortage of 78,000 truck drivers in 2022 as per ATA	▉▉▉▉☐ (4/5)
Shipping delays	—Extended product delivery times due to global factory and ports disruptions, and labor shortages —The Red Sea attacks in December 2023 led to an extra 10 days of transit time for Asian shipments to reach Europe	▉▉▉▉☐ (4/5)
Warehouse management	—High rentals are driving need to optimize warehouse space, better manage inventory, and improve order-picking process —US warehouse space rent surged by 18% in 2022, averaging $8.84 per square foot compared to $6.34 in 2020	▉▉▉☐☐ (3/5)
Sustainability targets	—Stricter regulations on carriers to reduce carbon emissions —Logistics contributes 8% of greenhouse gases globally, rising to 11% when factoring in warehouses and ports	▉▉▉☐☐ (3/5)
Tracking inconsistencies	—Outdated methods for monitoring shipments and assets —10% to 40% of supply chain assets are lost each year globally through misplacement, theft, or breakage	▉▉☐☐☐ (2/5)
Poor communication	—Supply chain communication issues due to staff shortages and frequent shipment delays —Global firms lose $62.4 million annually due to communication issues	▉▉☐☐☐ (2/5)
Government regulations	—Plethora of regulations poses an ongoing challenge —Regulation like HOS, Ocean Shipping Reform Act, Inflation Reduction Act, and IMO 2023 impact US logistics providers[2,3]	▉☐☐☐☐ (1/5)

[1] Compared to 2021

[2] HOS is hours of service.

[3] IMO is International Maritime Organization.

Sources: American Trucking Association, SHRM, Work Truck Solutions JLL, MIT, Royal Bank of Canada; Kearney analysis

Understanding AI and generative AI

Unleashing efficiency: how AI can address logistic challenges

Traditional **AI** helps businesses improve efficiency and resilience in the supply chain and logistics by offering more accurate predictions, optimizing processes, and enabling data-driven decision-making. Through real-time accurate information, streamlined communications, automated routine tasks, and comprehensive operational insights, logistics companies and shippers can elevate performance, enhance customer satisfaction, and reduce costs. Within supply chain and logistics, the technology is poised for remarkable growth. Projections indicate a significant rise in adoption rates from 15 percent in 2022 to 73 percent in 2027, marking an impressive nearly five-fold increase according to estimates by MHI. The overall AI in logistics market is anticipated to reach $23.1 billion in 2032, up from $3 billion in 2022.

Generative AI, on the other hand, is a subset of AI that focuses on generating new content, performing a moderate level of data synthesis, accelerating ideation and human-like outputs. It involves training AI models to understand patterns in existing data and then using that understanding to create high-quality content. In logistics, generative AI can help streamline external data sources, provide access to bespoke market intelligence, and conduct targeted market pulse checks. Additionally, it automates and expedites the process of generating solutions and designs, while also formulating strategies that are specifically tailored to address unique logistics challenges. The speed and efficiency derived from generative AI, analyzing diverse data and tracking real-time carrier performance, frees up human intelligence for strategic thinking and high-quality decision-making. Between 2022 and 2032, the generative AI in logistics market is expected to grow from $0.5 billion to $18.9 billion, an increase of 44 percent.

The power of AI and generative AI lies in their ability to improve a wide range of activities and processes across the logistics landscape, producing significant and measurable benefits for both logistics firms and shippers alike.

AI use cases and applications in logistics

Navigating logistics complexity with AI automation

AI provides indispensable automation capabilities, optimizing various facets of logistics operations through real-time data harnessed from sensors and interconnected devices. In figure 2 (on page 6), we review the top 15 areas where AI can enhance efficiency, reduce costs, improve visibility, and optimize resources—and highlight examples of logistics firms that are pioneering these efforts.

The successful implementation of AI in logistics hinges critically on the availability of good-quality and granular data, which forms the foundation for accurate analysis and decision-making. Having a robust data strategy in place is essential for scaling AI applications in logistics and extracting their full potential. (The reader can find the full details in the appendix.)

The successful implementation of AI in logistics hinges critically on the availability of good-quality and granular data.

Figure 2

There are a number of compelling opportunities for companies to deploy AI in very impactful ways

Use cases	Description	Industry adoption
Demand planning and forecasting	Predict demand and consumption patterns in real time, enabling companies to plan for future needs and optimize stock levels	**DPD Group's Speedy** optimizes short-term forecasts using AI algorithms, determining cost-effective transportation methods and identifying trips safe to cancel without affecting SLAs.
Inventory optimization and management	Determine optimal inventory levels, reduce carrying costs, and ensure supply meets demand	**XPO Logistics** uses AI and ML capabilities to analyze consumer demand and predict inventory levels for its retail customers.
Warehouse automation	Intelligent order picking and parcel sortation systems capable of selecting, categorizing, routing, and sorting packages	**DHLBot**, an AI-powered robotics arm, automated parcel sortation in APAC operations and increased operational efficiency by 40 percent.
Route optimization	Optimize delivery routes by considering demand trends, real-time traffic, weather, fuel efficiency, and more	**Maersk** uses AI to optimize its shipping route, reducing fuel consumption by 10 to 15 percent.
Autonomous delivery	Intelligent vehicles with capabilities to remotely navigate, interact, and operate in external environment	**UPS's AI-driven autonomous Class 8 trucks** shuttle packages from The UPS Store locations to a local UPS sorting facility for processing.
Real-time tracking of assets and shipments	Precise and timely information about the location, status, and conditions of logistics assets and goods in transit	**C.H. Robinson's** IoT and ML-equipped Navisphere platform enables shippers to track shipments' location and monitor variables like temperature, humidity, light, and pressure.
Delivery time prediction	Predict accurate delivery times and suggest best delivery options to buyers based on real-time data and historical trends	**Aramex** is using ML models for delivery predictions, achieving a 74% boost in prediction accuracy and 40% less call center volumes.
Pricing and offer management	Enables personalized proposals and dynamic pricing based on real-time internal and external factors	**DB Schenker's** AI Drive4Schenker platform offers load proposals to haulers. Algorithms learn from historical shipment data, suggesting carriers likely to accept offers and aiding dispatchers in cost estimation for trips.
Predictive maintenance	Anticipate potential problems related to vehicles and equipment, ensuring the reliability and security of the operations	**FedEx** deploys AI-driven predictive maintenance to prevent any unforeseen aircraft failures by replacing components proactively.
Workforce scheduling	Optimize the allocation of human resources for various tasks and shifts within logistics operation	**PostNord** invested in AI to automate scheduling, staff planning, and time reporting for 18,000 employees.
Customer service	Automated communication to enhance customer interactions, personalize services, improve response time and overall service quality	**UPS AI chatbot** helps customers track packages, locate UPS locations, and find shipping rates.
Freight matching	Optimizes the process for freight brokers to match shipper's load with the appropriate carrier's available capacity in real time	**Uber Freight's AI load matching** algorithm led to a 12% increase in bookings for active users, translating to a 3% overall boost in bookings and a 5% increase in clicks.
Sustainability	Improved route planning, reduced fuel consumption, and minimized carbon footprint through predictive analytics and real-time data, fosters efficient and eco-friendly logistics operations	**Maersk Line** optimizes container loading, scheduling, and route planning with generative AI, resulting in substantial fuel savings and a reduced environmental footprint.
Compliance management	Ensures real-time adherence to regulations, automating monitoring and reporting for seamless compliance, minimizing risks, and enhancing operational efficiency	**DHL Express'** APECC employs AI for screening of incoming shipments, ensuring compliance with international shipping regulations and rules from both origin and destination.
Risk management	Utilizes advanced algorithms to analyze real-time data, identify potential risks, and proactively mitigate disruptions, ensuring a resilient and secure supply chain	**DHL** employs advanced AI to capture, synthesize, and deliver risk scoring, providing predictive insights to anticipate and address issues for informed customer decision-making.

Notes: SLA is service level agreements. APECC is Asia Pacific Export Compliance Center.
Source: Kearney analysis

Future outlook

Autonomous trucks, smart roads, and smart contracts

Artificial intelligence is poised to revolutionize the transportation industry, reshaping supply chain management and potentially reducing human job roles. Morgan Stanley analysts highlighted that AI could **eliminate almost all human touchpoints in the supply chain**, including back-office tasks. For example, the bank's analysts said several hundred AI-powered autonomous trucks are expected to enter US roads in 2024. These trucks will lead to a 25 to 30 percent reduction in cost per mile, ultimately eliminating the need for human drivers—although the transition is expected to occur "beyond three years."

Another potential revolution in logistics that AI can trigger is **the implementation of smart roads**. Smart roads, incorporating sensors, solar panels, traffic data, AI, and big data, enhance visibility, communicate with autonomous vehicles, and monitor road conditions. For example, road pressure sensors will monitor vehicle weight and speed in real time for traffic regulation. Smart traffic signs will provide clear guidance to drivers for enhanced road safety and efficiency, including voice messages for smart car drivers. Traffic management networks with speed cameras will improve safety and reduce congestion by providing timely alerts about hazardous conditions, along with automated traffic-switching signals to reroute vehicles when needed, such as avoiding snowdrifts.

Generative AI algorithms provide an expansive perspective of the supply chain, empowering managers to optimize transportation and delivery, considering real-time factors such as traffic and weather. Future generative AI advancements promise superior performance and an ever-expanding range of opportunities to use company data for competitive advantage. For example, integrating generative AI in contract management will enable the creation of **smart contracts that automatically trigger when predefined conditions are satisfied**. This will enhance transparency, trust, and efficiency in logistics by automating tasks such as payment processing, shipment tracking, and dispute resolution. Additionally, generative AI in the future will be able to simulate diverse supply chain scenarios, **enabling logistics providers to test and enhance their strategies virtually**. Doing so identifies bottlenecks, inefficiencies, and risks, helping companies develop effective and resilient supply chain strategies.

Conclusion

AI holds transformative potential for logistics operations. Using extensive data analysis and pattern recognition, logisticians will have deeper insights in real time to make informed decisions for superior results. Despite these advantages, the implementation of AI projects is not without its challenges, and a significant majority of organizations struggle to generate a positive impact with AI initiatives. According to Gartner, nearly 85 percent of AI and machine learning projects don't yield a positive return on investment for businesses. The high failure rate is often attributed to factors such as poor scope definition, inadequate training data, low data quality and granularity, organizational resistance to change, mission creep, and a lack of experimentation. Hence, it's essential to acknowledge that each business operation is unique, and a specific technology's suitability will depend on various factors, including product mix, core processes, logistics infrastructure, and labor constraints.

To enhance their chances for AI success, companies should follow eight key steps:

1. Identify your target use cases, such as improving inventory management, optimizing delivery routes, or enabling predictive maintenance.

2. Prioritize and sequence use cases according to their ability to create value.

3. Develop a strategic plan that outlines the necessary resources and set realistic goals and timelines.

4. Choose the right technology for your supply chain operations.

5. Allocate resources to effective change management strategies—including educating the workforce about why change is necessary and promoting a coordinated effort to embrace new ways of working—to ensure successful adoption of new solutions.

6. Address data privacy and security concerns when implementing any technology in operations.

7. Consider potential ethical challenges and how they can be addressed.

8. Execute your implementation plan effectively to achieve your technology integration goals.

We are truly at an inflection point when it comes to AI's potential. By embracing AI and other next-generation technologies, companies can move beyond point solutions and completely transform their business workflows to become more cost-efficient, innovative, and competitive. That should be music to every logistician's ears.

Authors

Michael Zimmerman
Partner, New York
michael.zimmerman@kearney.com

Bharath Thota
Partner, Chicago
bharath.thota@kearney.com

Abhishek Mehrotra
Consultant, Gurugram
abhishek.mehrotra@kearney.com

Appendix

Figure
Additional AI use cases (1/2)

Use cases	Solution mechanics	Additional industry examples
Demand planning and forecasting	—Internal and external data collection from company database, IoT devices web scraping, and APIs —ML algorithms drive long-range forecasts for budgeting and asset planning, and short-range predictions for improved operational efficiency —Visual dashboards and reports to provide an overview of trends, patterns, and anomalies	**FedEx Dataworks** uses AI on customer data to help predict demand and returns in planning process.
Inventory optimization and management	—Gathers data from historical sales, demand patterns, lead times, supplier information, and external factors like seasonality or market trends —AI models analyze historical data and calculate safety stock levels based on demand variability —Establishes reorder points and optimizes EOQ to minimize total inventory costs	**Kuehne + Nagel's SwiftLOG** solution helps find the best option for container shipping and ensure optimum inventory levels.
Warehouse automation	—Sensors and cameras gather package data: attributes, dimensions, barcodes, and locations —ML algorithms identify patterns, optimizing picking and sorting routes —AI-driven robotic arms precisely pick and transport items using sensors and vision	**Cdiscount** is using AI robots to sort and prepare orders, increasing efficiency by 100%.
Route optimization	—Data gathering on delivery locations, traffic, and weather from geolocation, GPS, and weather stations —Generative AI-based ML algorithms —Visual dashboard for delivery details, view optimized routes, time windows, and ETA	**DHL Express' AI-powered AQCC system** identifies optimal routes through real-time monitoring of shipment movements.
Autonomous delivery	—Cameras, LiDAR, radar, and other sensors help to gather vehicle's surroundings data in real time —Integrated high-definition maps with AI-generated annotations for precise navigation —AI algorithms compute safe and efficient paths considering real-time obstacles and traffic conditions	**Amazon's Prime Air** service uses ML-powered drones to deliver packages under 5 pounds to customers in less than 60 minutes.
Real-time tracking of assets and shipments	—Captures data from GPS trackers, IoT sensors, traffic patterns, and weather forecasts —AI algorithms analyze historical and real-time data —Web or mobile dashboard provides real-time tracking, insights, and alerts for key stakeholders	AI-enabled **UPS My Choice** service allows customers to track and schedule deliveries in real time.
Delivery time prediction	—Gather data on delivery locations, traffic, weather, and historical delivery times from geolocation, GPS, weather stations, and internal databases —ML algorithms predict delivery times —A recommendation system suggests the most optimum delivery options to buyers based on factors like weather conditions, distance, and vehicle efficiency	**DHL's Follow My Parcel**, fueled by AI, offers customers dynamic delivery times, enhancing their experience. Additionally, AI-driven smart route planning empowers customers to select delivery times based on their availability.
Pricing and offer management	—Gather insights on customer profiles, pricing history, competitor pricing, and benchmarks —Utilize an AI engine for dynamic price adjustments based on real-time factors and predefined rules —Create personalized offers using AI algorithms and customer preferences —Analytics dashboard analyzes pricing impact on sales and profitability	**Kuehne + Nagel's** AI-driven eTrucknow platform generates simplified quotation and comparison process for domestic road logistics shipments.

Source: Kearney analysis

Figure

Additional AI use cases (2/2)

Use cases	Solution mechanics	Additional industry examples
Predictive maintenance	—IoT sensors gather real-time data on equipment, vehicle performance, temperature, and more —AI detects anomalies and predicts failures by analyzing deviations from the ideal state —AI sends real-time alerts to maintenance teams for detected anomalies or potential failures	**UPS' ML platform, Orion**, analyzes vehicle data to predict maintenance needs, minimizing breakdown risks and ensuring optimal condition.
Workforce scheduling	—Data gathering from historical schedules, workforce availability, ERP systems, and other sources —Define relevant variables like driver skills, vehicle capacity, and route information —Utilize AI-driven algorithms to create efficient workforce schedules, considering these variables	**DHL's AI platform IDEA** optimizes the allocation of manpower and thereby accelerates the throughput of goods and order cycles.
Customer service	—Data is collected from customer interactions, shipment tracking, and inventory management systems —AI algorithms process the collected data —AI-powered chatbots interact with customers to respond to their needs and offer recommendations	**XPO Logistics'** AI-powered chatbot automates phone calls to inform recipients of precise delivery times and locations.
Freight matching	—Data is collected from multiple sources such as historical shipping data, real-time traffic conditions, weather forecasts, and carrier availability —ML algorithms pair shipments with optimal carriers based on various factors —An intuitive portal for shippers to input shipment details, track deliveries, and receive updates	**Convoy's load board** is an AI-enabled tool that matches shippers with carriers. The solution achieved 95% match rate across the US.
Sustainability	—Use APIs to collect data from IoT sensors and GPS devices fitted on transportation vehicles, warehouses, and external sources —Utilize AI to calculate carbon emissions based on delivery modes, routes, and energy consumption —An intuitive dashboard for users to visualize key sustainability metrics and make informed decisions	**DHL's OptiCarton AI software** optimizes container space, potentially cutting unnecessary shipment space by 50%, leading to reduced truckloads and carbon emissions.
Compliance management	—Collect data from various logistics processes, such as shipments, routes, and regulatory databases —An AI-powered algorithm interprets and applies regulatory requirements dynamically; it generates automated compliance reports for stakeholders —AI-driven predictive analytics helps forecast potential compliance challenges	**Metro Shipping** is handling 1,500+ import/export declarations and transit accompanying documents weekly by using an AI solution.
Risk management	—Gather real-time data from diverse logistics processes, including shipment tracking, weather forecasts, traffic, and geopolitical events —ML algorithms predict potential risks based on historical data and real-time inputs —An intuitive dashboard provides customizable reports and data visualizations for different stakeholders	**Maersk** harnessed AI to develop a predictive cargo arrival model, aimed at enhancing schedule reliability and providing customers with advanced insights into their shipments.

Notes: ML is machine learning. SLA is service level agreements. AQCC is Advanced Quality Control Center
Source: Kearney analysis

Kearney is a leading global management consulting firm. For nearly 100 years, we have been a trusted advisor to C-suites, government bodies, and nonprofit organizations. Our people make us who we are. Driven to be the difference between a big idea and making it happen, we work alongside our clients to regenerate their businesses to create a future that works for everyone.

kearney.com

KEARNEY